इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 6409 (1971): Code of practice for oxy-acetylene flame cleaning [MTD 12: Welding Applications]

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

Made Available By
Public.Resource.Org

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS : 6409 - 1971

(Reaffirmed 2003)

Indian Standard

CODE OF PRACTICE FOR OXY-ACETYLENE FLAME CLEANING

UDC 621·7·022·4 : 662·769·241

© *Copyright* 1972

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 1

Price, Rs [redacted] Gr 3

March 1972

Indian Standard

CODE OF PRACTICE FOR OXY-ACETYLENE FLAME CLEANING

Welding General Sectional Committee, SMDC 14

Chairman	*Representing*
SHRI R. GHOSH	Indian Oxygen Ltd, Calcutta
Members	
SHRI J. K. AHLUWALIA	Stewarts & Lloyds of India Ltd, Calcutta
SHRI M. M. GHOSH (*Alternate*)	
SHRI N. C. BAGCHI	National Test House, Calcutta
SHRI B. C. BISWAS (*Alternate*)	
SHRI S. BALASUBRAMANIAM	Braithwaite & Co (India) Ltd, Calcutta
SHRI D. P. CHATTERJEE	Directorate General of Supplies and Disposals (Inspection Wing)
SHRI B. N. DAS	National Metallurgical Laboratory (CSIR), Jamshedpur
SHRI S. C. DAS	Hindustan Aeronautics Ltd, Bangalore
SHRI M. B. SHANKAR (*Alternate* I)	
SHRI T. V. VAREED (*Alternate* II)	
SHRI S. P. DASGUPTA	Central Mechanical Engineering Research Institute (CSIR), Durgapur
SHRI B. SEN (*Alternate*)	
EXECUTIVE ENGINEER (DESIGN-I), B & R BRANCH, CHANDIGARH	Public Works Department, Government of Haryana
EXECUTIVE ENGINEER (ELECTRICAL), ELECTRICAL DIVISION No. 1, NEW DELHI	Central Public Works Department, New Delhi
EXECUTIVE ENGINEER (ELECTRICAL), CENTRAL ELECTRICAL DIVISION No. 1, CALCUTTA (*Alternate*)	
EXECUTIVE ENGINEER, PWD	Public Works Department, Government of Tamil Nadu
GENERAL SUPERINTENDENT, PUBLIC WORKS WORKSHOPS AND STORES (*Alternate*)	
SHRI N. GHOSE	Bharat Heavy Plate & Vessels Ltd, Visakhapatnam
SHRI A. P. SANYAL (*Alternate*)	
SHRI C. P. GHOSH	Engineer-in-Chief's Branch, Army Headquarters
SHRI M. M. GUPTA	Ministry of Defence (DGI)
SHRI S. K. HARI	Malik Electric Works, Bombay
SHRI H. R. JOLLY (*Alternate*)	
SHRI V. G. JAGANNATH	Bharat Heavy Electricals Ltd, Tiruchirapalli
SHRI R. VISVANATHAN (*Alternate*)	

(*Continued on page* 2)

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 1

(*Continued from page* 1)

Members	*Representing*
Prof A. P. Jambulingam	Indian Society for Technical Education
Joint Director Research (Met-I), RDSO, Chittaranjan	Ministry of Railways
Chemist and Metallurgist, Integral Coach Factory, Perambur (*Alternate* I)	
Production Engineer (Shell), Integral Coach Factory, Perambur (*Alternate* II)	
Shri M. V. D. Kamath	Indian Engineering Association, Calcutta
Shri S. Majumdar	Directorate General of Technical Development
Shri S. V. Nadkarni	Advani-Oerlikon Private Ltd, Bombay
Shri P. S. Viswanath (*Alternate*)	
Shri V. G. G. Nayar	Power Cables Pvt Ltd, Bombay
Shri A. M. Lothe (*Alternate*)	
Col S. G. Pendse	Directorate General of Employment & Training, New Delhi
Shri H. L. Prabhakar	Larsen & Toubro Ltd, Bombay
Shri K. G. K. Rao	Tata Engineering & Locomotive Co Ltd, Jamshedpur
Dr J. Jain (*Alternate*)	
Shri S. C. Roy	Central Boilers Board, New Delhi
Shri V. V. Sathyanarayana	Mining & Allied Machinery Corporation, Durgapur
Shri N. Krishnamurthy (*Alternate*)	
Shri S. K. Sengupta	Hindustan Steel Ltd, Ranchi
Shri V. V. Kaviswar (*Alternate*)	
Shri N. K. Sethi	Bharat Heavy Electricals Ltd, Hardwar
Shri V. R. Subramanian	Indian Oxygen Ltd, Calcutta
Shri J. C. Acharya (*Alternate*)	
Shri T. N. Velu	Hindustan Shipyard Ltd, Visakhapatnam
Shri R. K. Srivastava, Deputy Director (Struc & Met)	Director General, ISI (*Ex-officio Member*)

Secretary

Shri M. S. Nagaraj
Assistant Director (Struc & Met), ISI

Subcommittee for Welding and Cutting Processes, SMDC 14 : 3

Convener	
Shri S. V. Nadkarni	Advani-Oerlikon Private Ltd, Bombay
Members	
Shri S. P. Dasgupta	Central Mechanical Engineering Research Institute (CSIR), Durgapur
Shri N. Ghose	Bharat Heavy Plate and Vessels Ltd, Visakhapatnam
Shri A. P. Sanyal (*Alternate*)	
Shri V. G. Jagannath	Bharat Heavy Electricals Ltd, Tiruchirapalli
Shri R. Visvanathan (*Alternate*)	
Shri V. R. Subramanian	Indian Oxygen Ltd, Calcutta

Indian Standard

CODE OF PRACTICE FOR OXY-ACETYLENE FLAME CLEANING

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 December 1971, after the draft finalized by the Welding General Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Oxy-acetylene flame has been effectively used for cleaning the thin, loosely adhering skin of mill-scale. Cleaning action of the blow-pipe is supplemented by scraping when the scale is thick. The process cannot remove firmly bonded and welded-on mill-scale which by itself will protect steel surface from corrosion. If the steel makers could provide the surface of steel sections with unbroken layer of firmly bonded or welded-on mill-scale, no anti-atmospheric corrosion measures, such as painting or galvanizing, would have been necessary.

0.3 Flame cleaning is employed as surface preparation for painting and not for other protective measures like metal spraying, galvanizing, etc. Flame cleaning as a surface preparation for painting has certain advantages. By painting as a flame cleaned surface, drying of the paint takes place inside-out and not outside-in as is the case when painted on cold surface. Also, having to paint on warm surface, the surface tension of the paint is reduced and the paint spreads easily and more evenly. Since the surface moisture is removed, the bond between the paint and the surface is improved.

0.4 This standard has been prepared as a guide to the fabricators for the correct use of the oxy-acetylene flame process for the cleaning of metal surfaces. In view of the wide application of this process, it is necessary to state clearly the conditions governing its use in order to fulfil the needs of the steel construction and shipbuilding industry.

0.5 In the formulation of this standard, the manufacturing and trade practices followed in the country in this field have been taken into consideration. Assistance has also been derived from the following publication:

Code of practice for oxy-acetylene flame cleaning. Welding in the World. 6, 2; 1968.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers equipment and procedures for cleaning the metal surfaces using oxy-acetylene flame.

2. EQUIPMENT

2.1 Oxygen gas shall conform to IS: 309-1965† and may be obtained either in one or more cylinders.

2.2 Acetylene gas shall conform to IS: 308-1962‡ and may be obtained either in one or more cylinders or from a pipe line acetylene supply.

2.2.1 If acetylene is obtained in one or more cylinders of dissolved acetylene, the hourly draw-off rate of the cylinder or of all the cylinders together shall not exceed the maximum indicated by the manufacturers. Since in most flame cleaning operations the hourly consumption is on average more than the maximum draw-off rate permitted by various manufacturers of gas, it is often necessary for flame cleaning to couple cylinders in parallel using manifolds or couplers.

2.3 Blow-Pipes — Flame cleaning blow-pipes may have a single flame (*see* Fig. 1) or a number of jets arranged in a line, the maximum distance between axes of each jet being 10 mm (*see* Fig. 2). It is recommended that the jets should be as close together as possible.

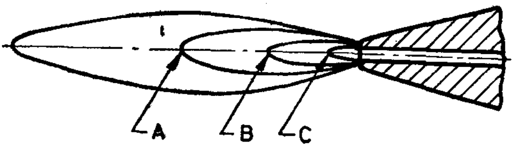

Fig. 1 Oxy-Acetylene Flame

---

*Rules for rounding off numerical values (*revised*).
†Specification for compressed oxygen gas (*revised*).
‡Specification for dissolved acetylene (gas) (*revised*).

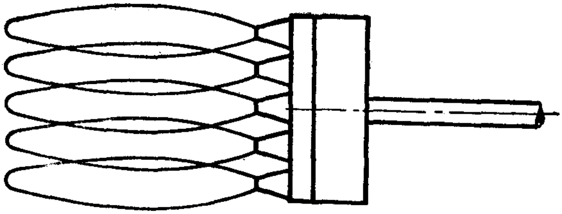

FIG. 2 MULTI-JET CLEANING BLOW-PIPE

2.3.1 The blow-pipes shall be fitted so that the operator can easily regulate the flame. The equipment may have runners, wheels or some other attachment so that once adjusted a steady distance is maintained, between the inner cone or cones and the surface to be cleaned at the same time providing a most useful support for the blow-pipe.

2.3.2 The general arrangement of the equipment should enable a steady flame to be obtained, maintaining the ratio of the length of inner cone to the diameter of the nozzle of the jet between 8 and 10.

2.3.3 For convenience of the operator, the blow-pipe may be extended by an extension piece.

2.4 Scraper — The scraper shall be made from thin sheet 70 to 100 mm wide attached to a sleeve 500 mm long with a wooden handle.

2.5 Wire Brush — The wires in the brush shall be dense, fine and hard.

3. PROCEDURE

3.1 Flame cleaning is normally limited to plates of thickness exceeding 6 mm so that the heat affectation is only confined to the layer of surface rust without appreciable distortion of the base metal plate. It is, however, possible to extend the range of application of flame cleaning or to eliminate certain difficulties arising out of local heating by various devices attached to the workpiece and by regulating the movement of the blow-pipe. The most common method is to keep the surface opposite to that being cleaned cold by a block of metal similar to the method used for welding thin sheets. Same effect may also be obtained by injecting water. Rapid condensation of the atmospheric humidity should, however, be avoided. In the case of rolled steel sections the thickness to be cleaned may be less than 6 mm, provided due attention is paid to the moment of inertia in order to avoid unacceptable distortion.

3.2 Conditioning of the Surface

3.2.1 The process may be applied directly to moderately rusted workpiece in as rolled, annealed or painted condition. In certain cases a preliminary cleaning, using an appropriate method should be effected. If the workpiece is severely rusted, it should be hammered and brushed before flame cleaning to remove the loose layers. If the workpiece is covered with a thick layer of old paint, it should be burnt off as a preliminary measure using suitable blow-lamps.

3.2.2 In certain exceptional cases, it may be useful to remove soots of oil, fat grease or other greasy substances by a solvent like kerosine, thereby preventing undesirable fumes and smokes. Obviously, any excess solvent should be carefully removed before flame cleaning.

3.3 Choice of a Blow-Pipe — For cleaning, flat surface of multi-flame torch should be used. In case of angular surfaces, heads of rivets, and pieces with pronounced curves, a single-jet blow-pipe or blow-pipes with heads specially-designed for the purpose should be used.

3.4 Flame Regulation

3.4.1 The flame should be distinctly oxidizing.

3.4.2 The flame should be harsh to prevent flash-backs and blocking of the nozzles. The high speed of the gas enables the oxides and particles loosened by the torch to be dispersed. The blow-pipes should be regulated in such a way that almost all the flames burn away from the nozzle and only stick when the burners touch the surfaces to be flame-cleaned.

3.5 Flame Position — Tips of the inner cones of the flame should brush the surface to be cleaned. The blow-pipe should be held at such an angle that the direction of the inner cones makes an angle of about 45° with the set-up of the plate in the direction of working (*see* Fig. 3).

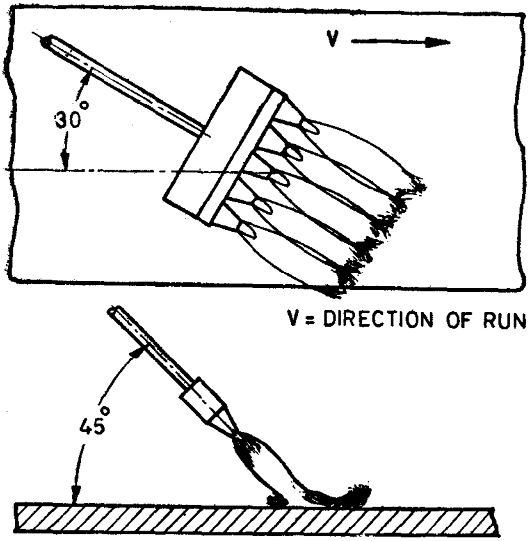

Fig. 3 Flame Position

3.6 Procedure — The upper layer to be removed should be heated quickly and as soon as the rust is heated to the descaling temperature (dull red) the blow-pipe should be moved forward steadily. The inner cones of the flames should be at an angle of about 30° with the direction of forward movement of the burner. To ensure that no area of the surface to be cleaned is left untouched by the flames (*see* Fig. 3), there should be sufficient overlap between the areas covered by two runs of the blow-pipe.

3.6.1 The direction of movement of the blow-pipe should follow the direction of the flame of the burner. On new plates the work should proceed either in the direction of rolling or in the direction transverse to it. The direction of cleaning should be reversed after completely cleaning of the entire width of the plate (*see* Fig. 4). The direction of work should, however, be towards the area not yet cleaned.

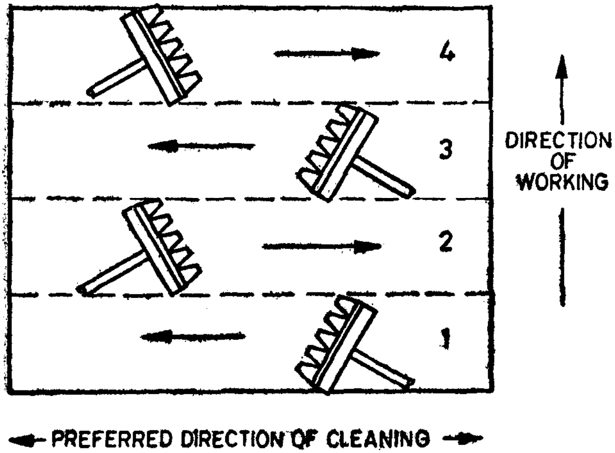

Fig. 4 Movement of Blow-Pipe and Direction of Working

3.7 Speed of Cleaning — The flame of the blow-pipe should be moved in such a speed as to dry the surface, to detatch dust, rust, loose flakes, rough and blistered patches besides any other similar unwarranted material by the strongly localized action of the heat produced in the cone of the flames and to blow them away. The blow-pipe should not be moved too slowly so as to prevent the congealing of the loosened flakes.

3.7.1 In general the speed of the blow-pipe depends on the type of the blow-pipe and the thickness of the workpiece being cleaned, and should be between 3 000 to 12 000 mm/min. Higher speeds of 9 000 to 12 000 mm/min should be used while cleaning thin sheets. Speeds below 6 000 mm/min should be used with blow-pipes with a single inner cone.

3.8 It is necessary to ensure that the blow-pipe with a sufficient number of flames conveniently arranged, covers all the parts of the surface to be cleaned before painting. Appropriate means of guides or marks shall be used for this purpose.

3.9 Scraping and Brushing — Cleaning action of the blow-pipe should be supplemented by scraping especially when the scale is thick. The layer of heated rust which is distinguished by its glowing appearance should be scraped off until the metal appears uniformly dark. The cleaned surface should be well brushed with a wire (preferably a rotating wire brush) immediately after flame cleaning and scraping. The brushing should be commenced within five minutes after cleaning.

3.10 Re-touching — Where necessary, a second cleaning may be carried out when required on workpieces which have been allowed to cool sufficiently.

3.10.1 In order to remove from the cleaned surface the dust collected from the workshop it may be necessary to run the blow-pipe on the workpiece several times but not exceeding three passes at speed 6 000 to 9 000 mm/min higher than that adopted for the first cleaning. A supplementary run can be made only after brushing.

4. PAINTING

4.1 Painting should be carried out when the metal surface is still warm (temperature to be compatible with the paint used) with a view to avoiding condensation of moisture on the surface and accumulation of dust.

4.2 Re-heating — If for some reasons painting cannot be carried out immediately after cleaning and if as a result the workpiece cools down it is often desirable to re-heat it quickly using appropriate equipment to clean the surface action of dust and moisture.

5. PERSONNEL

5.1 The flame cleaning operation should be entrusted to personnel well acquainted with the cleaning procedure and well trained in handling the equipment. The operator should be instructed to avoid holding the flame at a spot to prevent localized non-uniform heating and to avoid impairing the properties of the material.

5.2 Flame cleaning is not advisable in confined space without adequate ventilation measures. While cleaning surfaces previously painted with paints containing lead or zinc compounds safety equipment like masks or respirators should be employed.

6. OPERATING CHARACTERISTICS

6.1 In Appendix A, the consumption figures of oxygen and acetylene gases, time required for cleaning with single- and multi-run techniques, are given for information.

APPENDIX A

(*Clause* 6.1)

CONSUMPTION FIGURES OF OXYGEN AND ACETYLENE GASES

A-1. Based on well-established shop practice, the volumes of oxygen and acetylene gases consumed per hour for cleaning of plates of medium thickness are given in Table 1.

TABLE 1 CONSUMPTION OF OXYGEN AND ACETYLENE GASES FOR FLAME CLEANING

Size of the Burner (1)	Acetylene Consumption per Hour (2)	Oxygen Consumption per Hour (3)
mm	litre	litre
50	1 050	1 200
80	1 300	1 500
100	1 400	1 625
150	2 500	2 900
160	2 750	3 200
200	3 500	4 100
250	4 200	4 850

A-2. Consumption of oxygen and acetylene gases for single- and multi-run cleaning is given in Table 2.

TABLE 2 CONSUMPTION OF OXYGEN AND ACETYLENE GASES FOR SINGLE- AND MULTI-RUN OF FLAME CLEANING

Gas	Number of Runs	Consumption in Litres per Square Metre		
		Minimum	Average	Maximum
(1)	(2)	(3)	(4)	(5)
Acetylene	Single	185	205	225
	2	430	450	470
	3	695	710	725
	4	830	840	850
Oxygen	Single	210	235	261
	2	490	510	530
	3	810	825	840
	4	970	980	990

A-3. The time required for cleaning a square metre of surface area is given in Table 3.

TABLE 3 CLEANING TIME

NUMBER OF RUNS	TIME REQUIRED TO CLEAN ONE SQUARE METRE OF SURFACE AREA IN MINUTES		
	Minimum	Average	Maximum
(1)	(2)	(3)	(4)
Single	4·5	5·0	5·5
2	9·5	11·0	12·5
3	14·5	15·5	16·5
4	18·5	19·0	19·5